

Wickert et al.
Serial No. 09/893,608

REMARKS/ARGUMENTS

Reconsideration and allowance of the subject application in view of the above amendments and remarks is respectfully requested.

Claims 4-7 remain in the application. New claims 8-10 have been added. Claims 1-3 have been withdrawn. In view of the earlier restriction requirement, applicant retains the right to present withdrawn claims 1-3 in a divisional application.

Figure 3 is added to overcome the objection to the drawings. Figure 3 shows the gas turbine, the compressor, the variable stator vanes, the actuator and vane angle controller, and the output to an electric power grid as set forth in the specification and claims.

The specification is amended at paragraphs [0003], [0005] and [0006] to clarify the explanation of the background and the summary of the invention. A new paragraph [0009.1] is added after paragraph [0009] to describe Figure 3.

The rejection of claims 4-7 under 35 U.S.C. § 112, first paragraph, is traversed. Applicants respectfully contend that the subject matter of claims 4-7 is clearly set forth in the specification in such a way as to reasonably convey to one skilled in the art that the inventors had possession of the invention at the time the application was filed for at least the following reasons: Variable stator vanes are known in the art as indicated at paragraph [0003] in the Background Of The Invention section of the specification (see variable stator vanes discussed as being introduced in GE's H-series gas turbines). Apparatus and mechanisms such as mechanical actuators for varying the angular position of ganged stator vanes in turbine machines are also well known. (See, for example, U.S. Patent 4,430,043 to Knight et al. and U.S. Patent 5,308,226 to Venkatasubbu et al. listed on the attached PTO-1449 form.) An "under-frequency" condition of the power grid as well as operating conditions on the power grid at "base load" (i.e., the expected maximum power demand or greatest expected power load under otherwise normal conditions) are well known power grid operating conditions in the art and are discussed in the specification. (See, for example, applicants' specification at paragraph [0014].) For example, the occurrence of unexpected or abnormally large power loads on the power grid may create an under-frequency condition.

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In the present invention, the angular position of the stator vanes are determined according to two example schedules — a nominal schedule and an under-frequency schedule — which are developed to optimize compressor frequency and airflow under the respective different operating conditions of power grid. Example schedules are shown in FIGURE 1. As explained in the specification, the output power of a gas turbine may be modulated by varying the airflow volume consumed by the turbine compressor. When a drop in physical speed of the turbine is detected, an adjustment to the angular position of the variable stator vanes is made in an effort to maintain turbine output power. In the present invention, the variable stator vanes are opened in response to a reduction in physical speed of the turbine — which is tied to the electrical power grid frequency — in an effort to maintain a level of overall turbine power output. (i.e., No attempt is made to control/manipulate the physical speed of the turbine. After the gas turbine has already synchronized to the grid and is producing maximum output, the compressor front-end variable vanes are manipulated open in response to a drop in gas turbine speed. The controller senses the drop in physical speed and makes an adjustment to the variable stator vanes in an attempt to maintain gas turbine output.) (See applicants specification at pages 4-7).

The rejection of claims 4-7 under 35 U.S.C. § 112, second paragraph, as being indefinite is respectfully traversed. Claims 4-7 have been amended to more clearly set forth and distinctly claim applicants invention.

The rejection of claims 4-6 under 35 U.S.C. § 103(a) as being unpatentable over Faulkner et al. (U.S. Patent 4,370,560) in view of Reuther (U.S. Patent 4,536,126) is respectfully traversed. Faulkner et al. ('560) does not teach or disclose the use of variable stator vanes for a turbine compressor. Faulkner et al. ('560) is directed toward using an air compressor as a mechanical load and manipulating the compressor's *inlet guide vane* position to effect the mechanical power required to drive the compressor. Moreover, as admitted in the office action, Faulkner et al. does not teach or suggest that vane position (either inlet or stator) be varied in response to the compressor's rotational speed.

Reuther ('126) does not disclose or suggest the use of variable stator vanes. Reuther ('126) discloses a gas turbine system that only has variable *inlet* guide vanes (IGVs), which are apparently only used during turbine startup procedures. A controller

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generates an inlet guide vane position control signal as a linear function of turbine speed during startup from 20% ignition speed until the turbine reaches 95% of its rated operating speed (see col. 35, lines 4-17). There is no teaching or suggestion of varying vane position (either inlet or stator) to modulate the resultant turbine output power once the turbine has reached its rated operating speed. Consequently, neither Faulkner et al. ('560) nor Reuther ('126), considered either alone or together, teach or suggest applicants' method for controlling the output power of a gas turbine or a method of implementing a compressor operational strategy, as set forth in claims 4-6 or newly added claims 8-10.

All outstanding issues have been addressed and this application is in condition for allowance. Should any minor issues remain outstanding, the Examiner should contact the undersigned at the telephone number listed below so they can be resolved expeditiously without need of a further written action.

Respectfully submitted,

NIXON & VANDERHYE P.C.

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I hereby certify that this Amendment/Response and Transmittal Cover sheet is being facsimile transmitted to the Patent and Trademark Office for official filing on September 29, 2003 and specifically to PTO TC2800 fax number 703-872-9318.



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